Claims

We claim:

1. A method for scheduling a plurality of cars of an elevator system in a building, comprising:

receiving a call;

determining, for each car, based on future states of the elevator system, a first waiting time for all existing passengers if the car is assigned to service the call;

determining, for each car, based on a landing pattern of the plurality of cars, a second waiting time of future passengers if the car is assigned to service the call;

combining, for each car, the first and second waiting times to produce an adjusted waiting time; and

assigning a particular car having a lowest adjusted waiting time to service the call and to minimize an average waiting time of all passengers.

2. The method of claim 1 wherein the existing passengers include riding passengers in the plurality of cars having known arrival times, arrival floors, and destination floors, waiting passengers assigned to the plurality of cars having known arrival times, arrival floors and directions of travel, and a new passenger signaling the call, and all passengers include the existing and future passengers.

3. The method of claim 1 wherein the determining of the first waiting time further comprises:

evaluating a cost function to determine a cost for each future state; and

assigning a particular car associated with a set of states having a least cost.

4. The method of claim 1 wherein a substantial number of the future passengers arrive at a selected floor during an up-peak traffic period.

5. The method of claim 1 wherein the landing pattern of elevator cars at a selected floor is a vector-valued random variable **T** with a probability distribution $P(\mathbf{T})$, $\mathbf{T} \in T$ over a space of all possible landing patterns T.

6. The method of claim 5 wherein all possible landing patterns depend on landing times of the plurality of cars.

7. The method of claim 1 determining the landing pattern for a near future time interval.

8. The method of claim 8 wherein the near future time interval is an average time it takes the plurality of cars to make a round trip from a main floor of the building and back.

9. The method of claim 7 wherein the landing pattern for a far future time interval t is discounted by $\exp(-\beta t)$, where $\beta > 0$ is a discounting factor.

10. The method of claim 4 wherein future passengers arrive at the main floor according to a Poisson process with a rate λ.

11. The method of claim 1 wherein the landing pattern is modeled by a semi-Markov chain having a plurality of states and transitions.

12. The method of claim 1 wherein the first waiting time W and second waiting time V are combined according to $\alpha W + (1-\alpha)V$, where α is a weight in a range $0 \leq \alpha \leq 1$.

13. The method of claim 13 wherein an optimal weight α is in an interval [0.1, 0.3].

14. The method of claim 4 or 5, in which the selected floor is a main floor of the building.

15. An elevator scheduler for scheduling a plurality of cars of an elevator system in a building, comprising:

means for receiving a call;

means for determining, for each car, based on future states of the elevator system, a first waiting time for all existing passengers if the car is assigned to service the call;

means for determining, for each car, based on a landing pattern of the plurality of cars, a second waiting time of future passengers if the car is assigned to service the call;

combining, for each car, the first and second waiting times to produce an adjusted waiting time; and

assigning a particular car having a lowest adjusted waiting time to service the call and to minimize an average waiting time of all passengers.